TALLAHASSEE AREA
MINIMUM TEMPERATURE STUDY

Monthly Report-January 2002

National Weather Service-Tallahassee
Department of Meteorology, Florida State University

Introduction

This is the second monthly report describing minimum temperatures in the Tallahassee area. It is part of a long-term joint research project of the National Weather Service, Tallahassee and the Florida State University Department of Meteorology. The January 30 year average minimum temperature at the Tallahassee airport is 40 degrees. January 2002 was slightly milder than normal with an average minimum of 42.2 degrees.

January 2002

Twenty observers participated in the study and their locations are indicated on the attached map (Fig. 1). The observer locations represent a wide spatial distribution across Leon County.

Table 1 gives the raw daily minimum temperature data for each location in the network. These data can be used to compare any site with the others in the study. Note that January 4th-5th and 8th-9th were the coldest periods and January 23rd-31st represented a period of unseasonably mild temperatures. These periods demonstrate how changing synoptic scenarios affect minimum temperature ranges. Cold fronts pushed through the area on the 2nd and on the 6th depositing in excess of one-half inch of rain both times. In their wake, strong high pressure built in locally. With the frontal passages, winds shifted from southeast to northwest, increased and became gusty. As usual in winter, the coldest temperatures occurred several nights after the frontal passages when high pressure sank southward to the local area and dry north winds subsided to near calm. Overnight NWS airport observations, on the 4th and 5th and on 8th and 9th indicated clear skies and unlimited visibilities each night. This set up ideal conditions for radiational cooling, and the temperatures plummeted to their lowest values. Winds decreased from an average of 10.1 mph and 9.2 mph on the on the 3rd and 7th respectively to 3.3 mph and 2.7 mph on the 4th and 8th respectively. As the high began to move east and/or south in response to the next approaching front, winds become more east then southeast, and local temperatures modified.

Conversely, winds on the mildest nights were from the southeast to southwest, ahead of an approaching front. Overnight observations indicated onshore, relatively moist low-level flow that generated patchy to dense fog with stratus ceilings generally below 500 feet. Dense airport fog was reported on the 23rd--24th and on the28th-31st. This

significantly limited outgoing radiation resulting in unseasonably mild predawn lows in the lower 60s and upper 50s.

On the coldest days of the month, the Tallahassee urban heat island showed a range of ten degrees on both the 4th-5th and up to 14-15 degrees on the 8th and 9th respectively. This range is significant for a small city like Tallahassee, and it increases as winds decrease and radiational cooling increases. During the mildest nights, the ranges were generally 6 to 8 degrees, and, as expected, less than during cold outbreaks (Note Brogan was discounted due to suspect data). However, several days, most notably the 23rd, 26th and 27th, showed double-digit ranges including a 16-degree range on the 26th. These days were highlighted by several weaker nighttime cold fronts and/or warm fronts that placed the local sites alternately in the cold and warm sectors of the front. This likely accounted for the temperature ranges.

Figure 2 is a station histogram that shows how each site ranks in comparison to the other 19 sites during January 2002.

Table 2, labeled “Frequency of Extremes” smoothes out skewed results that are due to missing data. It is more informative than simple raw data or rank histograms, telling how many times (and the percentage of times) that your station ranked as one of the coldest or warmest four sites on a particular day.

One should note that the five coldest sites in January were also the coldest in December 2001. Additionally, four of the five warmest sites this month were the same as in December. Although, more months of data must still be gathered, these results strengthen the argument that selected locations tend to represent the extremes in the Tallahassee urban heat island. Once again, the coldest locations in order were Canopy Oaks, Chiles, Lundy, Oak Ridge and Binkley. Not surprisingly all are located farthest from downtown and in the most rural part of the county where natural surfaces predominate. Two are in the northwest, one in the northeast, one in the southwest and one in the south quadrants. Conversely, the five warmest (in order) are Brogan, Wakulla, Lericos, Bellenot and Fuelberg. Four of these sites represent those closest to the downtown area with only Wakulla located some distance south. As during December, the Tallahassee airport was one of the warmest four sites 29 percent of the time but one of the coldest only 6.5 percent of the time. Again, this substantiates that, contrary to popular belief, the airport does not represent a cold valley in area temperatures.

The above data also validate classical urban heat island studies which indicate that minimum temperatures decrease as you move away from the city center. Perhaps of greater interest in the spatial distribution of cold sites during and after a frontal passage. During a passage and the day after, when northwest and north wind speeds are strongest, locations in the northwest and north quadrant, not normally cold spots, rank amongst coldest for that day. This includes WCTV, Lanier and Sharp. However the following two days, when winds typically diminish and radiational cooling dominates, the distribution of coldest sites then encompasses all quadrants (see above) and is based

more on distance from downtown, amount of natural surfaces, topography, soil type all of which will be addressed in detail in future reports.

Summary

Since this is only the second month of Tallahassee minimum temperature data, preliminary assessments may be modified as additional data are collected. Nevertheless, even after only two months, the data imply that the Tallahassee urban heat island is more complex and the minimum temperature ranges are more varied than previously anticipated. Although temperatures generally decrease with distance from downtown, several factors can alter this circular distribution. In particular, the daily spatial distribution of coldest temperatures appears to be related to synoptic factors including the effect of frontal and post-frontal weather as well as topography and land use type. Future reports will investigate the reasons for these occurrences in more detail.

Figure 1: Observers Map

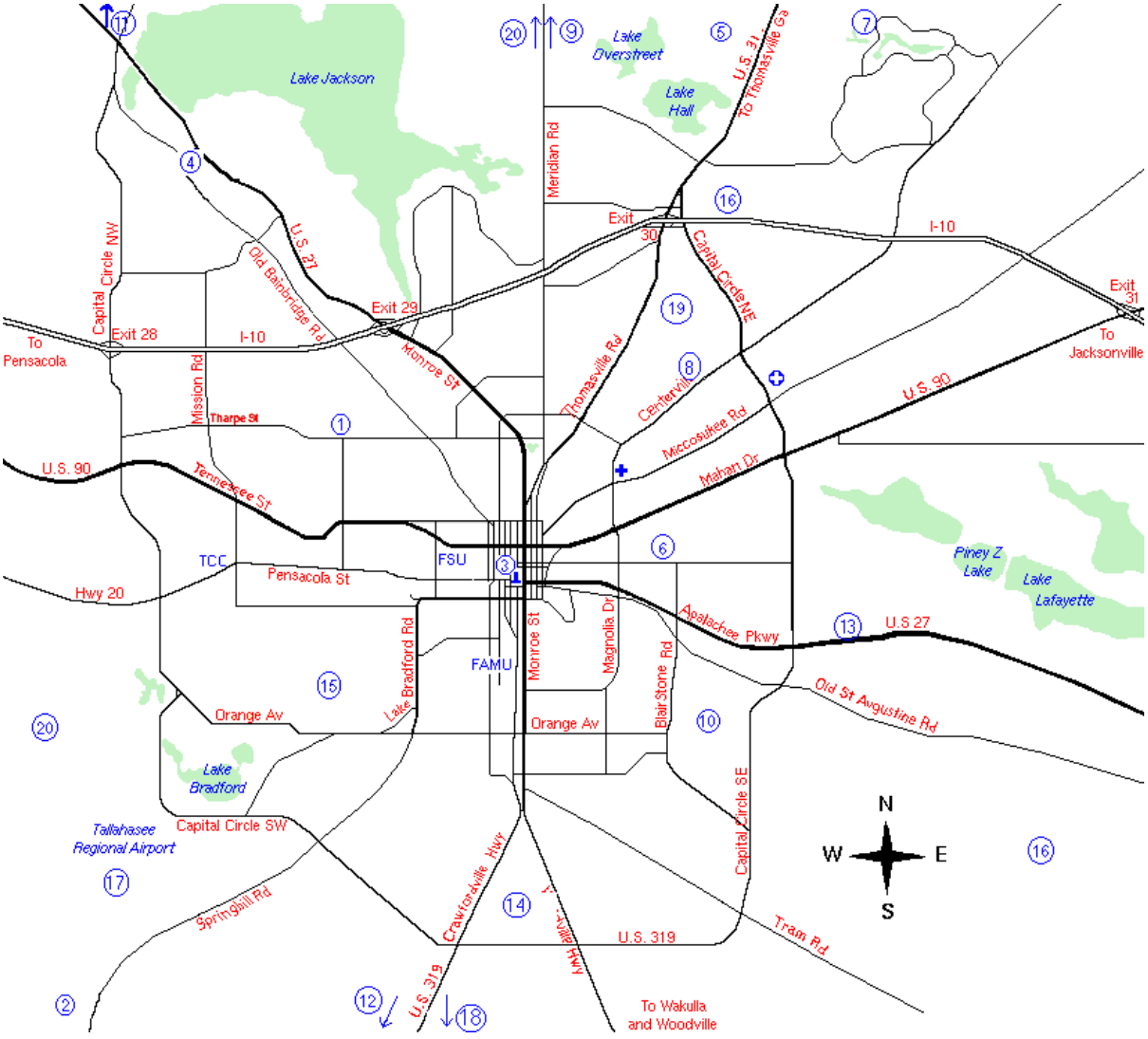

Table 1: Daily Minimum Temperature Data

Jan-02	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Bellenot		35	32	22	26	46	37	26		30	50	53	36	42	44	35
2. Binkley	26.2	34.9	32.7	16.5	16.3	35.2	34.9	19.6	21.4	32.7	42.6	54	30	35.1	42.3	26.1
3. Brogan		36	35	27	36	47	40	30	36	51	56	56	41	48	47	43
4. Canopy	27	31	30	19	18	44	33	22	23	33	46	48	32	37	36	27
5. Chiles											47	47	34	36	37	28
6. Elsner																
7. Fiorino	31.2	35	29.9	22.3	20.2	45.7	34.8	23.8	25	35.1	46.2	51	34.8	39.1	36.1	29.5
8. Fuelberg	33	37	34	25	23	45	39	26	28	38	48	53	37	41	45	32
9. Lanier				22	19.5	41	39	22.5	25	38	55	49	34	37	43	29
10. Lericos	33	35	34	26	24	47	38	26	28	42	47	46	38			
11. Lundy	29	34	32	19	17	39	34	21	21	34	45	48	32	35	44	27
12. McCool	27.5	36	26.2	20.8	19.6	45.9	28.6	22.8	24.2	35.2	42.6	46.2	34.2	36.9	34.5	28.2
13. Nayak										49	48	52	49	37	42	33
14. Oak R.	29	32	31	18	17	43	35	20	22	34	42	52	33	36	35	27
15. Sharp		29	31	19	20	40	34.5	22	23	34	45	52		32	42.5	29
16. Stuart					25	44	37	26	29	42	51	52				
17. TLH	29	40	34	21	19	41	37	21	23	34	45	50	33	38	35	28
18. Wakulla	32	35	34	25	23	50	39	26	27	40	47					
19. Watson	32	39	34	24	22	42	37	25	26	37	47	52	36			
20. WCTV	27	32	30	19	18	45	37	25	25	38	50	48	34	37	40	29
Mean	29.7	34.7	32	21.6	21.4	43.6	36.2	23.8	25.4	37.6	47.4	50.5	35.5	37.8	40.2	30.1
St. Dev.	2.48	2.89	2.35	3.11	4.77	3.58	2.8	2.77	3.72	5.54	3.77	2.86	4.45	3.71	4.23	4.34

Jan-02	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1. Bellenot	36	44	56	44	58	51	58	65	60	55	56	57	56	59	61
2. Binkley	25.7	35.1	53.4	41.7	54.9	44.1	56.7	62.8	59.2	55.4	56.5	58.6	53.2	53.1	58.8
3. Brogan	45	50	57	45	59	54	62	64	63	56	58	59	61	64	64
4. Canopy	28	36	53	39	50	43	58	61	57	52	49	53	50	51	56
5. Chiles	28	37	53	39	49	42	57	61	56	51	50	53	50	53	58
6. Elsner	31	40					56	63		54	55				
7. Fiorino	29.8	37.9	55.1	44	51	44.7	60.2	65.1	61.7	55.8	54.8	56.8	53.9	54.4	60.3
8. Fuelberg	34	40	56	44	57	47	58	64	62	55	57	57	55	57	61
9. Lanier	30	32	54	41	55	45	56	63	59.5		50		51.5	54	60
10. Lericos	34	42	55	44	54	47	58	64	64	67	59	59	55	56	62
11. Lundy	28	37	46	40	44	42	49	62	61	55	49	54	52	52	58
12. McCool	27.5	37.4	56.1	44.8	53.1	47.5	55.9	56.5	58.8	55.4	56.5	54.9	54.5	53.6	53.6
13. Nayak	33	41	54	55	53	47	56	62	59	53	55	55	54	57	59
14. Oak R.	27	35	53	42	52	44	55	61	60		54	55	52	54	59
15. Sharp	29	37				42	56	63	61	54	56	56	52	56	60
16. Stuart				42	56	50	57	64	60	54	54	56	55	59	62
17. TLH	29	36	56	45	57	46	59	64	63	57	58	58	53	54	61
18. Wakulla							61	62	63	56	57	59	56	56	60
19. Watson	31				55	47	59	65	62	57	55	55	55	56	61
20. WCTV	28	38	54	39	51	45	59	63	58	53	50	54	51	55	60
Mean	30.8	38.6	54.1	43.1	53.5	46	57.3	62.8	60.4	55.3	54.5	56.1	53.7	55.5	59.7
St. Dev.	4.5	4.13	2.6	3.86	3.76	3.25	2.7	1.97	2.17	3.34	3.18	2.03	2.59	2.97	2.3

Summary Data for January 2002

National Weather Service: Tallahassee

Average Minimum:	42.7
Coldest Minimum:	19
Date:	1/5
Warmest Minimum:	64
Date:	1/24
Total Number of Freezes:	7
Days With Observations:	31
Missing Days:	0

Figure 2: Rank Histogram

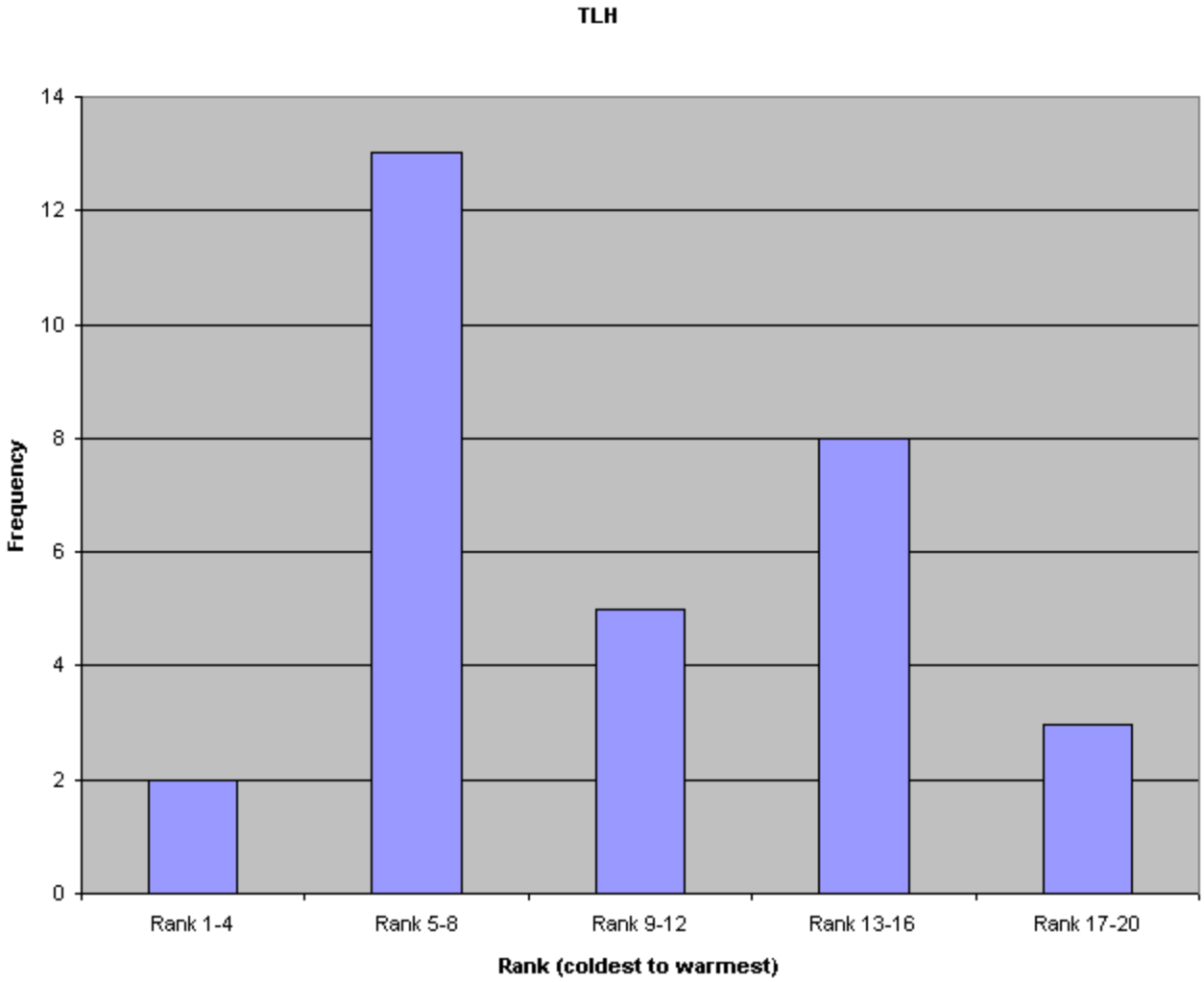

Table 2: Frequency of Extremes

Site	Total Obs	Coldest 4	Warmest 4	% in Coldest 4	% in Warmest 4
Bellenot	29	1	13	3.4	44.8
Binkley	31	14	2	45.2	6.5
Brogan	30	0	27	0	90
Canopy	31	26	0	83.9	0
Chiles HS	21	14	0	66.7	0
Elsner	6	1	0	16.7	0
Fiorino	31	2	3	6.5	9.7
Fuelberg	31	0	13	0	41.9
Lanier	25	4	2	16	8
Lericos	28	1	15	3.6	53.6
Lundy	31	20	1	64.5	3.2
McCool	31	11	4	35.5	12.9
Nayak	22	1	6	4.5	27.3
Oak Ridge	30	14	0	46.7	0
Sharp	26	5	0	19.2	0
Stuart	20	0	8	0	40
TLH	31	2	9	6.5	29
Wakulla	20	0	12	0	60
Watson	25	0	7	0	28
WCTV	31	8	2	25.8	6.5